

Selective Growth Technique for Hexagonal and Triangular Air-hole Arrays and Its Application to Air-bridge Type Photonic Crystal Slabs

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Selective area metal-organic vapor phase epitaxy (SA-MOVPE) on GaAs (111)B patterned substrates enables us to form sub-micron scale periodic nanostructures having atomically flat vertical sidewalls [1, 2]. Here, we report on the fabrication of air-hole arrays by SA-MOVPE and its application to photonic crystal slabs.

The samples are grown on patterned substrates having periodic SiO₂ hexagonal masks in 400-500 nm-pitch. In SA-MOVPE, growth occurs only in the regions without masks. As a result, hexagonal air-hole arrays are formed. By changing the growth conditions, it is possible to fabricate triangular air-hole arrays, because of lateral growth over the masks, which takes place only at three corners of hexagon. Furthermore, by employing selective under-cut etching, air-bridge type structure is fabricated as shown in Fig. 1.

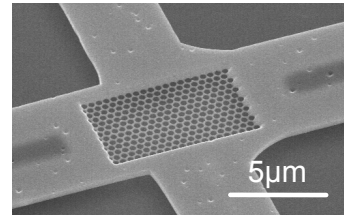


Fig. 1: SEM image of an air-bridge type structure shown in Fig. 1.

[1] S. Ando, N. Kobayashi and H. Ando, *Jpn J. Appl. Phys.* **32** (1993) L1293.

[2] T. Hamano, H. Hirayama and Y. Aoyagi, *Jpn J. Appl. Phys.* **36** (1997) L286.